RESERVOIR 29
Greene-Sullivan State Forest

Sullivan County

2005 Fish Management Report

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EXECUTIVE SUMMARY

- Historically, Reservoir 29 has had low pH, creating marginal water quality for fish and aquatic vegetation. Although a low pH of 4.5 was documented in 2005, subsequent pH readings reflect the same general trend that the reservoir is slowly progressing towards a more biologically stable system. There is no evidence that Reservoir 29 is subjected to low pH values for any sustained period of time.

- A low density bass/bluegill fishery exists. Bluegill ranged from 1.9 to 9.0 in TL. The electrofishing catch rate was 95 bluegill/h. Bluegill of harvestable size accounted for 14% of bluegill collected. Largemouth bass ranged from 3.7 to 16.8 in TL. The largemouth bass electrofishing catch rate was 27 bass/h.

- Aquatic vegetation in Reservoir 29 consist of creeping water primrose and a unique species of low phosphate tolerant water bulrush, *Scirpus subterminalis.*

- The pH and alkalinity at Reservoir 29 should continue to be monitored.

TABLES

FIGURES

INTRODUCTION

Reservoir 29 is a 140-acre impoundment located in the Greene-Sullivan State Forest (Figure 1). It has a maximum depth of 26 ft and an average depth of 14 ft. The reservoir has a gravel boat ramp and is restricted to electric motors. Reservoir 29's watershed was extensively mined and the reservoir itself was originally constructed as a water source for a coal wash operation. Poor mining practices left the reservoir depleted of nutrient sources and with an acidic pH and negligible alkalinity. The Division of Reclamation provided monitoring data from as early as 1972 when the pH was 2.6.

In 1988, the Division of Reclamation completed a reclamation project under the Abandoned Mine Land program on approximately 91 acres on the west shore of the reservoir's watershed to reduce leaching of coal refuse. Improvements were also made on the dam and parking area. In 1989, the pH was in the low 4's. Fish collected in Reservoir 29's watershed included largemouth bass, bluegill, redear, hybrid sunfish, warmouth, green sunfish, and channel catfish. A successful bioassay was conducted in 1993 and a subsequent netting survey yielded seven panfish already in the reservoir. (Andrews 1994). Reservoir 29 was stocked with largemouth bass, bluegill, and redear fingerlings in the fall of 1993. The pH was approximately 4.5. The pH has been recorded annually in late summer at established sample sites since 1993. The pH was documented as high as 6.5 by Schoenung in 2002.

The last general survey conducted at Reservoir 29 was on August 10 to 12, 1998. This report presents results of a general survey of Reservoir 29 in 2005, water chemistry data taken from 2006 to 2007, and management recommendations.

METHODS

A standard fish survey was conducted at Reservoir 29 on June 6 to 8, 2005. Sampling effort consisted of 1.0 h of pulsed DC night electrofishing, 6 overnight trap net sets, and 3 overnight gill net sets. Fish were measured to the nearest 0.1 in TL. Scales samples were taken from game species for age and growth analysis. District averages were used to estimate fish weight. Proportional stock density (PSD) was calculated for largemouth bass and bluegill (Anderson and Neumann 1996). Water chemistry parameters were measured according to the Manual of Fisheries Survey Methods (Shipman et al. 2001) and verified with HACH.

Tier II aquatic vegetation sampling was conducted on July 6, 2005 according to Pearson (2004). A GPS unit was used to record the location of the limnological data and fish collection sites. A follow-up water chemistry profile was conducted on July 5, 2006. Fish tissue samples were collected October 18, 2006 and analyzed by IDEM. Additional pH samples were taken in 2007.

RESULTS

Water quality data was collected in June during the general survey at two of the three historical sample sites, Station 1 and Station 3 (Figure 2 & 3). At Station 1, the conductivity was 640 μS at the surface and 660 μS near the bottom (21 ft). The Secchi disk reading was 19 ft 0 in. Dissolved oxygen (DO) was 6.6 ppm at the surface and 6.0 at the bottom. The pH was 4.5 at the surface and 4.6 at the bottom. Alkalinity was less than 17.1 ppm at the surface and bottom. At Station 3, the conductivity was 630 μS at the surface and 980 μS near the bottom (28 ft). The Secchi disk reading was 17.5 ft. The DO was 7.0 ppm at the surface and 0.8 ppm at the bottom. The highest DO reading was 7.3 at 12 ft. DO was adequate for fish survival to a depth of 18 ft. The pH was 4.7 at the surface and 5.8 at the bottom. Alkalinity was less than 17.1 ppm at the surface and 51.3 ppm at the bottom.

The July 2006 water chemistry sampling documented a 7:00 am pH at Station 1 of 7.2 at the surface and 5.5 at the bottom (Table 1). By 1:30 pm, the pH had risen to 8.0 at the surface and 6.4 at the bottom. At 7:30 am Station 3's pH was 6.9 at the surface and 6.7 at the bottom. By 2:00 pm, the pH had risen to 7.9 at the surface and 7.3 at the bottom. Shoreline and inlet pH ranged from 7.1 to 7.5. Shoreline sediment pH ranged from 6.4 to 8.0.

Subsequent pH readings were taken by property personnel at the ramp on January 26, March 23, and June 29, of 2007 (Siscoe 2007). HACH kit readings ranged from 6.5 to 7.0. Fish tissue samples were collected October 18, 2006 and submitted to IDEM as part of the 2006 Fish Consumption Advisory monitoring (Stahl 2007).

During the aquatic vegetation survey in July there was a blue-green planktonic bloom. The Secchi disk reading was reduced to 6.5 ft. The pH was 5.8. The only submersed plant found was a unique species of low phosphate tolerant water bulrush, *Scirpus subterminalis* (Washington State Department of Ecology 2006). The site frequency was 62.9% and in certain areas of the lake water bulrush blanketed the bottom to a depth of 14 ft. Creeping water

primrose occurred sporadically along the shoreline and a stand of *Phragmities* was noted near the dam on the east side of the reservoir.

A total of 173 fish representing seven species was collected during the survey with an estimated weight of 33.7 lbs. Species collected in the 1998 survey, but not in this survey include redear and hybrid sunfish (Schoenung 1999). Bluegill dominated the catch by number (57%) followed by largemouth bass (19%), longear sunfish (9%), and yellow bullhead (8%). Green sunfish, black bullhead and warmouth were also collected.

The bluegill sample consisted of 98 fish ranging from 1.9 to 9.0 in TL. The average length was 4.0 in. Bluegill represented 7% of the total weight of fish collected. The electrofishing catch rate was 95 bluegill/h. The bluegill PSD was 17. Bluegill of harvestable size accounted for 14% of bluegill collected. Growth was slower than the previous survey in 1998.

The largemouth bass sample consisted of 32 fish ranging from 3.7 to 16.8 in TL. Bass represented 17% of the total weight of fish collected. The electrofishing catch rate was 27 bass/h. The bass PSD was 35. Bass growth was below average to age 2 and average thereafter.

Fifteen longear sunfish were collected that ranged from 2.4 to 5.2 in TL. Other fish collected included 13 yellow bullhead, seven green sunfish, seven warmouth and one black bullhead.

DISCUSSION

Historically Reservoir 29 has had low pH, creating marginal water quality for fish and aquatic vegetation. Until the June 2005 survey, the annual fall water quality samples indicated slight improvements in pH each year. The June 2005 water quality tests had a low pH of 4.5 and alkalinity has consistently been low (<17.1 ppm).

Normal shifts in pH occur daily during photosynthesis and respiration. However, in systems with low alkalinity more drastic shifts in pH can occur during biological activity. In order to gain a more representative assessment of the water quality at Reservoir 29, multiple samples were taken around the reservoir from early morning to early afternoon on July 5, 2006. Subsequent pH readings were consistent with prior fall samples with the exception of the bottom sample at Site 1 which had a pH of 5.5 at 7am (Table 1).

Other issues to consider with low pH systems are that heavy metals and other toxins become more soluble, increasing exposure to aquatic life (Wurts 1992). Because of the low pH reading of 4.5 and historical water quality data, fish samples were collected for IDEM in 2006 to determine if there is a consumption risk to humans. No PCBs, organochlorine pesticides, lead or cadmium were found in edible fish tissue (Stahl 2007). Quantification of mercury placed Reservoir 29 at the lowest level, Group 1, for bluegill and redear under 9 in and for bullhead under 12 in. Largemouth bass were at the state default, Group 2. Definitions of Group ratings can be found in the Indiana Fish Consumption Advisory, 2007. Additional pH readings were taken by property personnel in the winter and spring of 2007. The pH values were in the 'normal' range for this reservoir. There is no evidence that Reservoir 29 is subjected to low pH values for any sustained period of time.

The fish community has shown slight improvement from the last survey even with a reduction in both bass and bluegill growth. This is likely a result of more fish competing for limited resources. The PSD for bass has increased and is in the range for a balanced fishery. The bluegill PSD is slightly lower than the optimal range. Inconsistent recruitment is always a concern but, in low nutrient, less than optimal pH conditions, these factors are more likely to lead to an unstable fish community. A pH as low as 5.0 during the spawn can have negative affects on fish reproduction and embryonic development (Kazumasa 1999). Based on the survey results, recruitment of largemouth bass and bluegill has been consistent. Six year classes of bluegill and five year classes of largemouth bass were collected.

Aquatic vegetation in Reservoir 29 compared to previous surveys has actually shown a slight increase in distribution and diversity. This may be a sign that Reservoir 29 is progressing towards a more biologically stable system. This is a slow process and artificially stimulating the system to increase its buffering capacity is not cost effective and may actually do more harm than good.

RECOMMENDATION

- The pH and alkalinity at Reservoir 29 should continue to be monitored.

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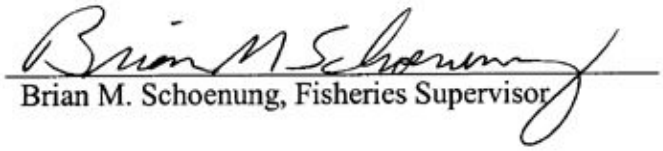
Approved by: 
Brian M. Schoenung, Fisheries Supervisor

Date: March 14, 2007

Table 1. Reservoir 29, Sullivan County, Water Chemistry Profile July 5, 2006.

		Water Temp °F		DO (ppm)		SECCHI	pH		Alkalinity (ppm)		
Depth (ft)		7:00am	1:30pm	7:00am	1:30pm	7:00am	7:00am	1:30pm	7:00am	TDS (mg/L)	Cond(μS)
Station 1:	0	82.4	82.6	8.15	10.45	8'6"	7.2	8.0	17.1	0.23	470
	2	82.4		8.42							
	4	82.4		8.48							
	6	82.4		8.41							
	8	82.4		8.36							
	10	82.0		7.60							
	12	80.1		7.70							
	14	76.3		9.70							
	16	71.8		10.74							
	18	69.4		10.55							
	20	67.5	72.0	10.75			5.5	6.4	17.1		
		7:30am	2:00pm	7:30am	2:00pm	7:30am	7:30am	2:00pm	7:30am		
Station 3:	0	82.4	83.1	7.65	10.46	7'10"	6.9	7.9	17.1	0.23	
	2	82.6		7.50							
	4	82.6		8.90							
	6	82.6		8.58							
	8	81.9		8.96							
	10	81.1		9.03							
	12	79.9		8.67							
	14	76.5		8.13							
	16	71.6		9.96							
	18	68.7		9.50							
	20	62.6		21.13							
	22	57.9		2.25							
	24	54.0	63.0	1.69			6.7	7.3	68.4		

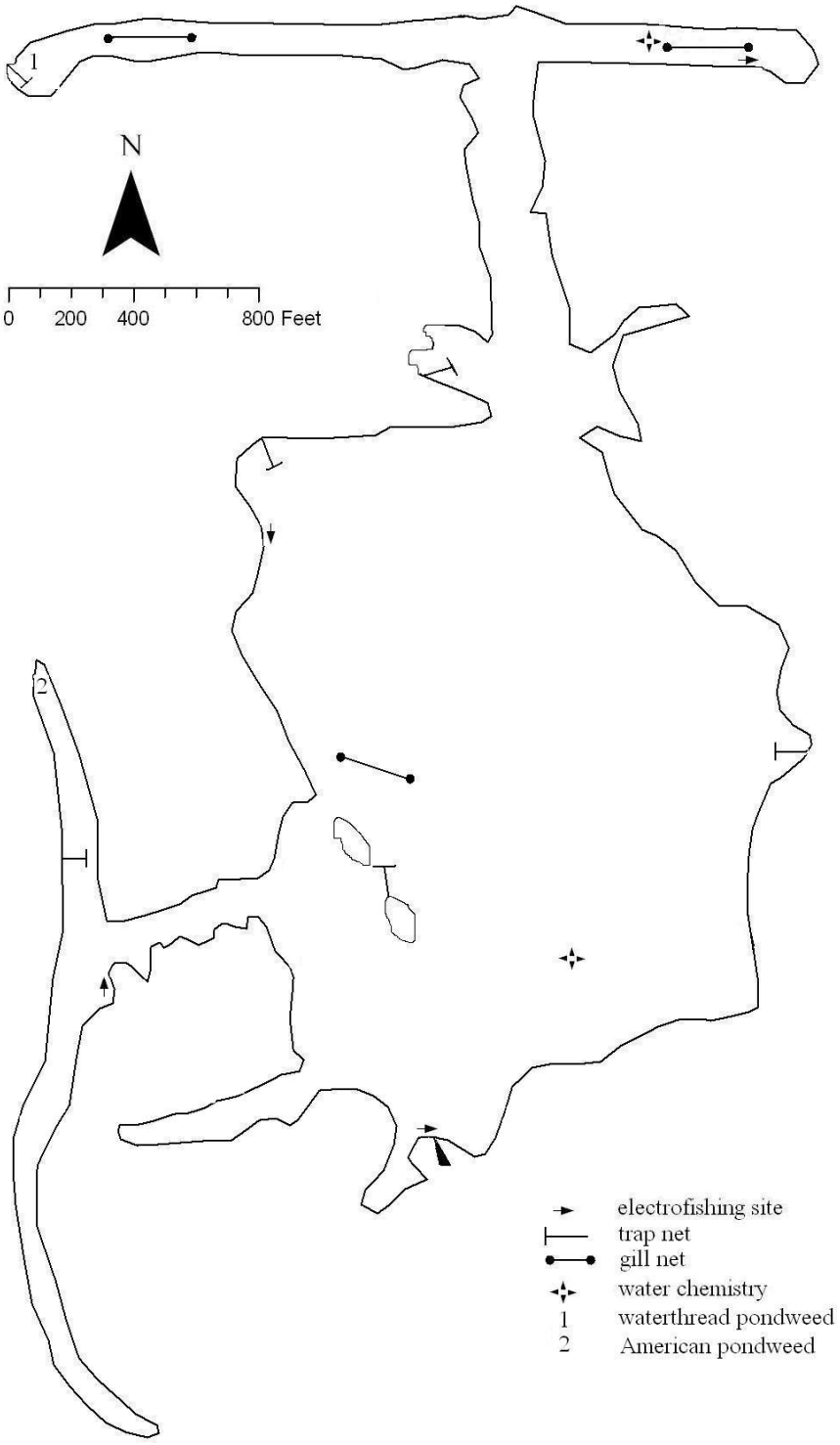


Figure 1. Reservoir 29, Sullivan County. Location of water chemistry, gill nets, trap nets, and electrofishing stations, 2005. Location of American (1) and waterthread (2) pondweeds noted in 2006.

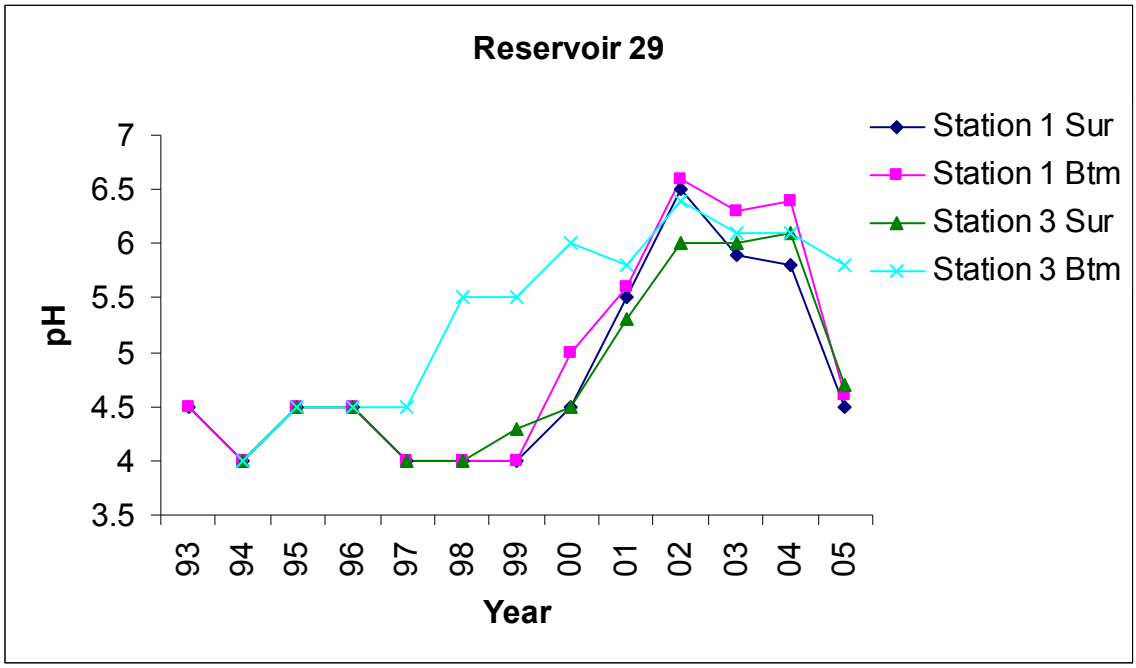


Figure 2. Reservoir 29, annual surface and bottom pH taken from 1993 to 2005 at Station 1 and Station 3.

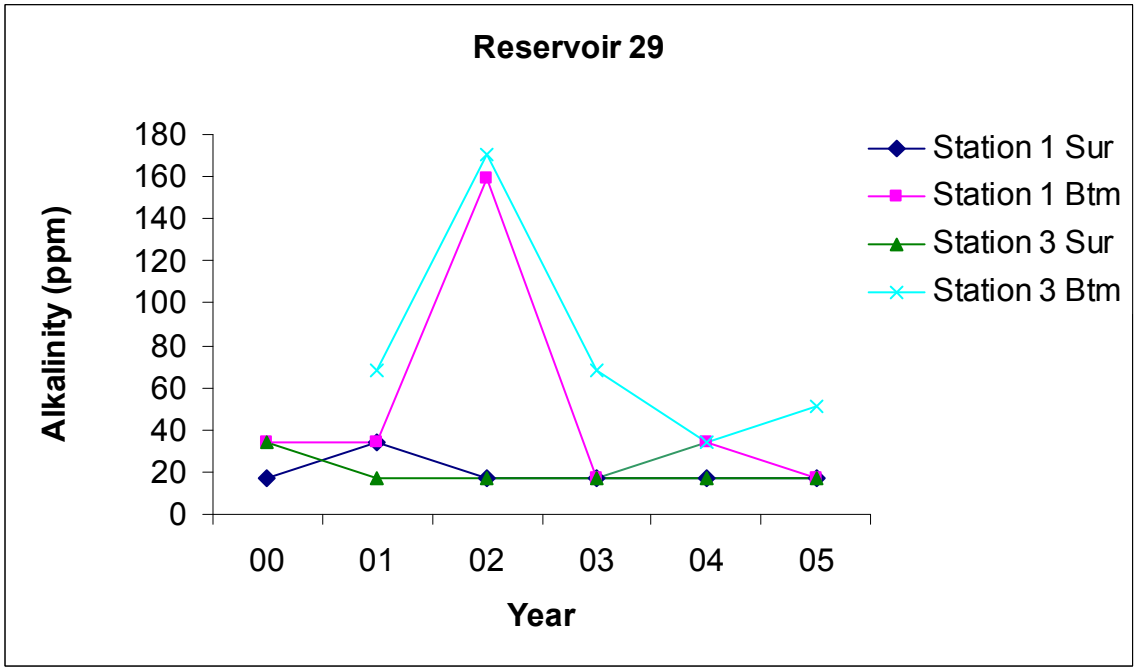


Figure 3. Reservoir 29, annual surface and bottom alkalinity taken from 2000 to 2005 at Station 1 and Station 3.

LAKE SURVEY REPORT

Type of Survey: [ ] Initial Survey [X] Re-Survey

Lake Name	County	Date of survey (Month, day, year)
Reservoir 29	Greene	June 6 to 8, 2005
Biologist's name		**Date of approval (Month, day, year)**
King and Pritchett		March 14, 2007

LOCATION

Quadrangle Name	Range	Section
Linton, Sandborn	8W	36
Township Name	**Nearest Town**	
7N	Pleasantville	

ACCESSIBILITY

State owned public access site	Privately owned public access site	Other access site
Gravel boat ramp.		

Surface acres	Maximum depth	Average depth	Acre feet	Water level	Extreme fluctuations
140	26 Ft.	14 Ft. *	1,960 Ft. *		

Location of benchmark

INLETS

Name	Location	Origin
Intermittent Stream	Northeast end	Little Fry Lake, Private ponds
Intermittent Stream	East end	Little Ham and Ladder Lakes

OUTLETS

Name	Location
Culvert	29A

Water level control

POOL	ELEVATION (Feet MSL)	ACRES
TOP OF DAM		
TOP OF FLOOD CONTROL POOL		
TOP OF CONSERVATION POOL		
TOP OF MINIMUM POOL		
STREAMBED		

Bottom type

- [X] Boulder
- [ ] Gravel
- [X] Sand
- [X] Muck
- [X] Clay
- [ ] Marl

Watershed use

Reclaimed mine land, State Forest

Development of shoreline

Gravel boat ramp.

Previous surveys and investigations

Water chemistry: 1972, 1974 through 1977, 1982, 1984, 1989 through 2004.

Watershed survey 1990, Spot check survey 1993. Standard survey 1998.

*Estimated

SAMPLING EFFORT					
ELECTROFISHING	Day hours: N/A		Night hours: 1		Total hours: 1
TRAP NETS	Number of traps: 3		Number of Lifts: 2		Total effort: 6
GILL NETS	Number of nets: 3		Number of Lifts: 1		Total effort: 3
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS, STATION 1	
Color: Green	Turbidity: 19 Feet 0 Inches (SECCHI DISK)
Alkalinity (ppm)*: Surface: <17.1 Bottom: <17.1	pH: Surface: 4.5 Bottom: 4.6
Conductivity: 640 µS (660 µS bottom)	Air temperature: 87 °F
Water chemistry GPS coordinates: N 38.999002	W -87.243604

TEMPERATURE AND DISSOLVED OXYGEN (D.O.), STATION 1								
DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	80.4	6.6						
2	80.4	6.6						
4	77.2	6.7						
6	76.3	6.7						
8	75.2	6.8						
10	73.9	6.8						
12	73.0	6.9						
14	72.7	6.9						
16	71.6	6.8						
18	69.6	6.2						
20	69.1	5.8						
21	68.7	6.0						

COMMENTS

*ppm-parts per million

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
TRAP NETS	Number of traps		Number of Lifts		Total effort
GILL NETS	Number of nets		Number of Lifts		Total effort
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS, STATION 3	
Color: Green	Turbidity: 17 Feet 6 Inches (SECCHI DISK)
Alkalinity (ppm)*: Surface: <17.1 Bottom: 51.3	pH: Surface: 4.7 Bottom: 5.8
Conductivity: 630 μS (980 μS bottom)	Air temperature: 87 °F
Water chemistry GPS coordinates: N 39.006987	W -87.242497

TEMPERATURE AND DISSOLVED OXYGEN (D.O.), STATION 3								
DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	82.4	7.0						
2	81.5	6.9						
4	80.8	6.9						
6	79.3	6.9						
8	77.2	7.1						
10	75.0	7.3						
12	74.1	7.3						
14	72.7	7.2						
16	72.0	6.5						
18	69.1	5.5						
20	63.5	4.5						
22	57.6	1.5						
24	53.8	0.9						
26	52.7	0.8						

COMMENTS

*ppm-parts per million

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT AT RESERVOIR 29, 2005.					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Bluegill	98	56.6	1.9 - 9.0	6.75	20.0
Largemouth bass	32	18.5	3.7 - 16.8	16.51	49.0
Longear sunfish	15	8.7	2.4 - 5.2	0.74	2.2
Yellow bullhead	13	7.5	9.3 - 12.1	7.29	21.6
Green sunfish	7	4.0	2.0 - 3.8	0.22	0.7
Warmouth	7	4.0	2.7 - 7.5	1.54	4.6
Black bullhead	1	0.6	10.7	0.66	2.0
TOTAL	173			33.71	

*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLUEGILL AT RESERVOIR 29, 2005.									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0	5	5.1	**	1	20.0				
2.5	14	14.3	0.01	1,2	20.5				
3.0	16	16.3	0.02	2	21.0				
3.5	18	18.4	0.03	2	21.5				
4.0	14	14.3	0.04	2,3	22.0				
4.5	7	7.1	0.06	2,3	22.5				
5.0	6	6.1	0.08	2,3	23.0				
5.5	5	5.1	0.11	3,4	23.5				
6.0	4	4.1	0.15	3,4,5	24.0				
6.5	3	3.1	0.19	3,4,5	24.5				
7.0					25.0				
7.5	1	1.0	0.30	4,5	25.5				
8.0	2	2.0	0.37	5,6	26.0				
8.5	1	1.0	0.45	4,5	TOTAL	98	100		
9.0	2	2.0	0.54	5					
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	95.0/h	GILL NET CATCH	0.0/lift	TRAP NET CATCH	0.5/lift

* Average weights derived from district averages

** Less than 0.01 pound

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF LARGEMOUTH BASS AT RESERVOIR 29, 2005.									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5	1	3.1	0.02	1	21.5				
4.0	4	12.5	0.03	1	22.0				
4.5					22.5				
5.0	1	3.1	0.05	1	23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5	4	12.5	0.15	1	25.5				
8.0	2	6.3	0.22	1	26.0				
8.5					TOTAL	32	100		
9.0									
9.5	2	6.3	0.37	2,3					
10.0	2	6.3	0.43	2,3					
10.5	2	6.3	0.51	2,3					
11.0	6	18.8	0.58	2,3					
11.5	1	3.1	0.67	2,3					
12.0	2	6.3	0.77	2,3					
12.5									
13.0	2	6.3	1.02	3,5					
13.5	1	3.1	1.18	3,4					
14.0	1	3.1	1.32	4					
14.5									
15.0									
15.5									
16.0									
16.5									
17.0	1	3.1	2.43	5					
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	27.0/h	GILL NET CATCH	0.7/lift	TRAP NET CATCH	0.5/lift

* Average weights derived from district averages

Species Bluegill	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE (in)	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				I	II	III	IV	V	VI	VII	VIII
Intercept=0.8	2004	8	1.9 - 2.6	1.8							
	2003	20	2..7 - 5.2	1.4	3.2						
	2002	11	3.9 - 6.6	1.3	2.5	4.6					
	2001	6	5.3 - 7.6	1.3	2.6	4.2	5.6				
	2000	5	6.2 - 9.0	1.4	2.5	4.2	6.5	7.8			
	1999	1	8	1.3	2.1	3.3	4.8	6.3	7.6		
	AVERAGE LENGTH			1.5	2.7	4.4	6.1	7.8			
	YR CLASSES AVERAGED			5	4	3	2	1.0			
	DISTRICT AVERAGE			1.5	2.7	4.2	5.8	6.6	7.5	8.0	

Species Largemouth bass	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE (in)	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				I	II	III	IV	V	VI	VII	VIII
Intercept=0.8	2004	4	7.5 - 8.0	6.4							
	2003	6	9.5 - 12.1	7.4	10.2						
	2002	9	9.7 - 13.4	7.9	10.0	11.0					
	2001	2	14.0 - 16.8	9.4	12.4	14.3	15.0				
	2000	1	13.1	6.6	8.2	9.9	11.4	12.4			
	AVERAGE LENGTH			7.3	10.1	11.0					
	YR CLASSES AVERAGED			3	2	1					
	DISTRICT AVERAGE			3.9	7.6	10.4	12.4	14.6	19.1	19.5	

GPS LOCATIONS OF SAMPLING EQUIPMENT																				
GILL NETS							TRAP NETS							ELECTROFISHING						
1	N	38.99900	W	-87.24360			1	N	39.00083897	W	-87.2410049			1	N	38.99749	W	-87.24517		
	N	39.00714	W	-87.24825			2	N	38.99900216	W	-87.2436038				N	38.99927	W	-87.241659		
2	N	39.00692	W	-87.24161			3	N	39.00414806	W	-87.2451982			2	N	39.006915	W	-87.2416		
	N	39.00699	W	-87.24250			4	N	39.00351254	W	-87.2470341				N	39.007262	W	-87.244888		
3	N	39.00077	W	-87.24621			5	N	38.99989039	W	-87.2492818			3	N	39.00282	W	-87.247097		
	N	39.00058	W	-87.24543			6	N	38.99961236	W	-87.2456707				N	38.999799	W	-87.246803		
4	N		W				7	N		W				4	N	38.999890*	W	-87.249281*		
	N		W				8	N		W					N	38.999612*	W	-87.245670*		
5	N		W				9	N		W				5	N		W			
	N		W				10	N		W					N		W			
6	N		W				11	N		W				6	N		W			
	N		W				12	N		W					N		W			
7	N		W				13	N		W				7	N		W			
	N		W				14	N		W					N		W			
8	N		W				15	N		W				8	N		W			
	N		W				16	N		W					N		W			
9	N		W				17	N		W				9	N		W			
	N		W				18	N		W					N		W			
10	N		W				19	N		W				10	N		W			
	N		W				20	N		W					N		W			
11	N		W											11	N		W			
	N		W												N		W			
12	N		W											12	N		W			
	N		W												N		W			
13	N		W											13	N		W			
	N		W												N		W			
14	N		W											14	N		W			
	N		W												N		W			
15	N		W											15	N		W			
	N		W												N		W			
16	N		W											16	N		W			
	N		W												N		W			
17	N		W											17	N		W			
	N		W												N		W			
18	N		W											18	N		W			
	N		W												N		W			
19	N		W											19	N		W			
	N		W												N		W			
20	N		W											20	N		W			
	N		W												N		W			

*Estimated

Occurrence and Abundance of Submersed Aquatic Plants at Reservoir 29, 2005

Date:	7/6/05	Littoral sites with plants:	23	Species diversity:	0.15
Littoral depth (ft):	14.0	Number of species:	2	Native diversity:	0.15
Littoral sites:	35	Maximum species/site:	2	Rake diversity:	0.17
Total sites:	38	Mean number species/site:	0.69	Native rake diversity:	0.17
Secchi:	6.5	Mean native species/site:	0.69	*Mean rake score:	0.89

Common Name	Site frequency	Relative density	Mean density	Dominance
Creeping water primrose	5.7	0.09	1.50	1.7
Spikerush	62.9	0.83	1.32	16.6

Other Observed Plants:
Phragmities